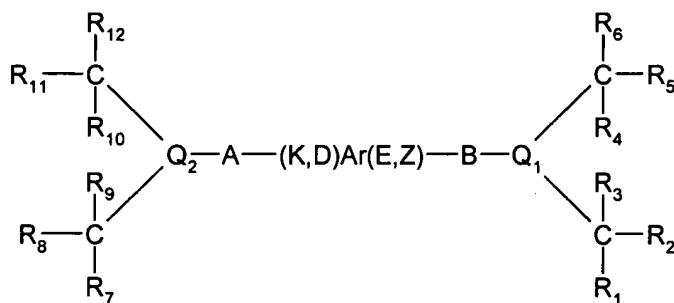


AMENDMENTS TO THE CLAIMS

1. (Original) A process for the carbonylation of C₃-C₂₀ ethylenically unsaturated compounds which process comprises reacting said C₃-C₂₀ ethylenically unsaturated compound with carbon monoxide in the presence of a source of hydroxyl groups and of a catalyst system, the catalyst system obtainable by combining:

- (a) a metal of Group VIII or a compound thereof; and
- (b) a bidentate phosphine of general formula (I)



wherein:

Ar is a bridging group comprising an optionally substituted aryl moiety to which the phosphorus atoms are linked on available adjacent carbon atoms;

A and B each independently represent lower alkylene;

K, D, E and Z are substituents of the aryl moiety (Ar) and each independently represent hydrogen, lower alkyl, aryl, Het, halo, cyano, nitro, OR¹⁹, OC(O)R²⁰, C(O)R²¹, C(O)OR²²,

$\text{NR}^{23}\text{R}^{24}$, $\text{C(O)NR}^{25}\text{R}^{26}$, $\text{C(S)R}^{25}\text{R}^{26}$, SR^{27} , C(O)SR^{27} , or $-\text{J-Q}^3(\text{CR}^{13}(\text{R}^{14})(\text{R}^{15}))\text{CR}^{16}(\text{R}^{17})(\text{R}^{18})$ where J represents lower alkylene; or two adjacent groups selected from K, Z, D and E together with the carbon atoms of the aryl ring to which they are attached form a further phenyl ring, which is optionally substituted by one or more substituents selected from hydrogen, lower alkyl, halo, cyano, nitro, OR^{19} , OC(O)R^{20} , C(O)R^{21} , C(O)OR^{22} , $\text{NR}^{23}\text{R}^{24}$, $\text{C(O)NR}^{25}\text{R}^{26}$, $\text{C(S)R}^{25}\text{R}^{26}$, SR^{27} or C(O)SR^{27} ;

R^1 to R^{18} each independently represent lower alkyl, aryl, or Het;

R^{19} to R^{27} each independently represent hydrogen, lower alkyl, aryl or Het;

Q^1 , Q^2 and Q^3 (when present) each independently represent phosphorous, arsenic or antimony and in the latter two cases references to phosphine or phosphorous above are amended accordingly ;

wherein the carbonylation reaction is carried out at a temperature of between -30°C to 49°C and under a CO partial pressure of less than $30 \times 10^5 \text{ N.m}^{-2}$.

2. (Original) A process according to claim 1, wherein R^1 to R^{18} each independently represent C_1 to C_6 alkyl, C_1 - C_6 alkyl phenyl (wherein the phenyl group is optionally substituted as defined herein) or phenyl (wherein the phenyl group is optionally substituted as defined herein).

3. (Currently Amended) A process according to claim 1 ~~claims 1 or 2~~, wherein R¹ to R¹⁸ each independently represent non-substituted C₁ to C₆ alkyl such as methyl, ethyl, n-propyl, isopropyl, n-butyl, iso-butyl, tert-butyl, pentyl, hexyl and cyclohexyl.

4. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein each of the groups R¹ to R³, R⁴ to R⁶, R⁷ to R⁹, R¹⁰ to R¹², R¹³ to R¹⁵ or R¹⁶ to R¹⁸ together independently may form cyclic structures such as adamantyl, 1-norbornyl or 1-norbornadienyl.

5. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein each R¹ to R¹⁸ group represents the same lower alkyl, aryl, or Het moiety as defined herein.

6. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein, each R¹ to R¹⁸ represents methyl.

7. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein each Q¹, Q² and Q³ (when present) represents phosphorous.

8. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein in the compound of formula I, A, B and J (when present) each independently represent C₁ to C₆ alkylene which is optionally substituted as defined herein.

9. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the lower alkylene which A, B and J may independently represent is -CH₂- or -C₂H₄-.

10. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein K, D, E or Z independently represents hydrogen.

11. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein two of K, D, E and Z together with the carbon atoms of the aryl ring to which they are attached form a phenyl ring, the phenyl ring being optionally substituted with one or more substituents selected from aryl, lower alkyl (which alkyl group may itself be optionally substituted or terminated as defined below), Het, halo, cyano, nitro, OR^{19} , $OC(O)R^{20}$, $C(O)R^{21}$, $C(O)OR^{22}$, $NR^{23}R^{24}$, $C(O)NR^{25}R^{26}$, SR^{27} , $C(O)SR^{27}$ or $C(S)NR^{25}R^{26}$ wherein R^{19} to R^{27} each independently represent hydrogen or lower alkyl (which alkyl group may itself be optionally substituted or terminated as defined herein).

12. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the hydroxyl group containing compound includes water or an organic molecule having a hydroxyl functional group.

13. (Original) A process according to claim 12, wherein, the organic molecule having a hydroxyl functional group may be branched or linear, and comprises an alkanol, particularly a C_1 - C_{30} alkanol, including aryl alkanols, which may be optionally substituted with one or more substituents selected from lower alkyl, aryl, Het, halo, cyano, nitro, OR^{19} , $OC(O)R^{20}$, $C(O)R^{21}$, $C(O)OR^{22}$, $NR^{23}R^{24}$, $C(O)NR^{25}R^{26}$, $C(S)R^{25}R^{26}$, SR^{27} or $C(O)SR^{27}$ as defined herein. Highly

preferred alkanols are C₁-C₈ alkanols such as methanol, ethanol, propanol, iso-propanol, iso-butanol, t-butyl alcohol, n-butanol, phenol and chlorocapryl alcohol.

14. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the carbonylation of an ethylenically unsaturated compound as defined herein may be performed in one or more aprotic solvents.

15. (Currently Amended) A process according to claim 1 ~~any of claims 1-12~~, wherein the reaction is carried out in the absence of any external aprotic solvent ie. an aprotic solvent not generated by the reaction itself.

16. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the process is carried out with the catalyst comprising a support.

17. (Currently Amended) A process according to ~~any~~ claim 15, wherein the support material is porous silica which has a surface area in the range of from 10 to 700 m²/g, a total pore volume in the range of from 0.1 to 4.0 cc/g and an average particle size in the range of from 10 to 500 μm.

18. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the organic groups R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, R¹⁰, R¹¹ and R¹² when associated with their respective carbon atom form composite groups which are at least as sterically hindering as t-butyl.

19. (Original) A process according to claim 1, wherein the bidentate ligands are selected from bis (di-t-butyl phosphino)-o-xylene (also known as 1,2 bis (di-t-butylphosphinomethyl) benzene); 1,2 bis (diadamantylphosphinomethyl) benzene; 1,2 bis (diadamantylphosphinomethyl) naphthalene; 1,2 bis (di-t-pentyl phosphino)-o-xylene (also known as 1,2 bis (di-t-pentyl-phosphinomethyl) benzene); and bis 1,2 (di-t-butyl phosphino) naphthalene.

20. (Currently Amended) A process according to claim 1 ~~any preceding claims 1-18~~, wherein suitable Group VIII B metals or a compound thereof which may be combined with a compound of formula I include cobalt, nickel, palladium, rhodium and platinum.

21. (Original) A process according to claim 19, wherein suitable compounds of such Group VIII metals include: salts of such metals with, or compounds comprising weakly coordinated anions derived from, nitric acid; sulphuric acid; lower alkanolic (up to C₁₂) acids such as acetic acid and propionic acid; sulphonic acids such as methane sulphonic acid, chlorosulphonic acid, fluorosulphonic acid, trifluoromethane sulphonic acid, benzene sulphonic acid, naphthalene sulphonic acid, toluene sulphonic acid, e.g. p-toluene sulphonic acid, t-butyl sulphonic acid, and 2-hydroxypropane sulphonic acid; sulphonated ion exchange resins; perhalic acid such as perchloric acid; halogenated carboxylic acids such as trichloroacetic acid and trifluoroacetic acid; orthophosphoric acid; phosphonic acids such as benzenephosphonic acid; and acids derived from interactions between Lewis acids and Broensted acids; the optionally

halogenated tetraphenyl borate derivatives; zerovalent palladium complexes particularly those with labile ligands; or tri(dibenzylideneacetone)dipalladium.

22. (Original) A process according to claim 20, wherein the anion may be derived from or introduced as one or more of an acid having a pKa measured in aqueous solution at 18°C of less than 4.

23. (Currently Amended) A process according to claim 1 ~~any preceding claims~~, wherein the carbonylation is carried out at a temperature of between -10 to 45°C.

24. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the carbonylation is carried out at a CO partial pressure of less than $15 \times 10^5 \text{ N.m}^{-2}$.

25. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the reaction is carried out on ethylenically unsaturated C₃-C₂₀ compounds.

26. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the ethylenically unsaturated compound is an alkene having 1, 2, 3 or more carbon-carbon double bonds per molecule.

27. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the ethylenically unsaturated compound may, when there are sufficient number of carbon atoms, be linear or branched, be substituted, be cyclic, acyclic or part cyclic/acyclic, and/or be

optionally substituted or terminated by one or more substituents selected from lower alkyl, aryl, alkylaryl, Het, alkylHet, halo, OR¹⁹, OC(O)R²⁰, C(O)R²¹, C(O)OR²², NR²³R²⁴, C(O)NR²⁵R²⁶, NO₂, CN, SR²⁷ wherein R¹⁹ to R²⁷ each independently represent hydrogen or lower alkyl.

28. (Currently Amended) A process according to claim 1 ~~any preceding claim~~, wherein the ethylenically unsaturated compounds may be independently selected from ethene, propene, 1-butene, 2-butene, isobutene, 1-pentene, 2-pentene, 3-pentene and branched isomers thereof, 1-hexene and its isomers, 1-heptene and its isomers, 1-octene and its isomers, 1-nonene and its isomers, 1-decene and its isomers, the C₁₁-C₂₀ alkenes and their known isomers, 3-pentenitrile, methyl-3-penteneoate, 1,3 butadiene, 1,3-pentadiene, 1,3 hexadiene, 1,3 cyclohexadiene, 2,4-leptadiene, 2-methyl 1,3 butadiene.

29. (Canceled)

30. (Original) An acid or ester produced by the carbonylation of an ethylenically unsaturated compound in accordance with the present invention.

31. (Canceled)